

APPLICATION OF ARTIFICIAL INTELLIGENCE FOR INNOVATION OF SMALL AND MEDIUM SCALE BUSINESSES IN NIGERIA

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Abstract

The objective of every business is to meet the customer demands and stand out among their competitors and more. Recognizing this fact many business managers source for ways of improving their business which include the use of Artificial intelligence. This paper highlights the application of artificial intelligence for innovation of small and medium scale businesses in Nigeria. This paper highlights key applications, benefits, challenges and recommendation through content analysis. The application of Small and medium Scale enterprises (SMEs), such as virtual assistants and chatbots, Voice recognition software and Robotic process automation, Also the study assess the potential benefits, including enhanced customer service, Cost saving, Enhanced decision making, The study examines various challenges that small- and medium-scale enterprises (SMEs) in Nigeria faces when implementing artificial intelligence (AI). These difficulties include shortage of specialized personnel and knowledge, the high cost of integrating and maintaining AI systems .Finally the paper examines the recommendation to tackle the challenges mentioned, which includes government development of national strategy for AI that encourages, integrates, and maintains its use among small and medium scale business .Government and SMEs management should work together to create secure data mechanisms and provide staff training and skill development to enhance AI capabilities.

Keywords: Artificial Intelligence, Innovation, Small and Medium business, Business,

Introduction

The advent of artificial intelligence (AI) has revolutionized the way businesses operate, innovate, and compete in the global market. Small and medium-scale businesses (SMBs) are no exception, as they increasingly leverage AI to drive innovation, improve efficiency, and enhance customer experiences. This paper explores the applications of artificial intelligence for innovation in small and medium-scale businesses. Artificial intelligent is one of the trending concepts in contemporary literature. In other words, artificial intelligence is a subject matter that scholars in different fields of endeavor are currently trying to harness its importance and applicability in their unique fields of endeavor (Oguejiofor et al., 2025). Current iterations of AI therefore are largely industry driven, created with the utmost goals of enabling new businesses and improving on the efficiency of existing fields. Artificial intelligence is gradually transforming every facet of our economy, such as the health care, energy, agriculture finance, manufacturing education section etc. artificial intelligence can be used to play a major role in shaping the growth of some core sectors in Nigeria (Oguejiofor

el et al., 2025). In business, artificial intelligence (AI) is more than just a trend; it's a crucial tool reshaping how we approach marketing and customer engagement.

According to research, nearly 9 out of 10 business leaders are gearing up to boost their investments in AI and machine learning (ML), especially in marketing.

Why this surge? At the heart of this AI revolution is the ability to segment behaviours and target specific customer groups with precision. It's about making smarter decisions, crafting more personalized strategies and understanding customer needs on a deeper level all of which are crucial across various business units. (www.sproutsocial.com/insights 2024).

According to Russell and Norvig (2020), artificial intelligence is defined as "the study of agents that receive percepts from the environment and perform actions" (p. 12).

Oguejiofor and Eya (2022) stated that the trends of computer-based and web-based educational system is receiving more attention in this era of information and communication technology due to expulsive expansion of the World Wide Web and internet. As AI technologies continue to progress rapidly, an increasing number of SMEs are incorporating AI into their business strategies to gain a competitive advantage (Gonesh et al., 2023). Kaplan (2019) defines artificial intelligence as "a collection of technologies that enable machines to perform tasks that would typically require human intelligence, such as learning, problem-solving, and decision-making" (p. 25).

The successful application of AI tools in industrial settings is crucial for the efficient processing and interpretation of data, which can benefit both strategies to gain a competitive advantage (Gonesh et al., 2023). The success of Small and medium scale business is very paramount, as they are the backbone of the development of every economy in the world (Szedlak et al., 2020). Artificial intelligence (AI) is widely regarded as a vital future technology for solving intricate business challenges. As per Jadhav (2021), AI has emerged as the preferred solution for solving complex business problems across various industrial sectors, particularly among small and medium scale businesses. In fact, Nigeria as a country, view the integration of AI into Small and medium scale businesses as a key factor for future national growth. (Ebuka et al., 2023). Artificial intelligence is often referred to as machine intelligence, displayed by machines, as opposed to the intelligence displayed by human beings. Haenlein and Kaplan (2019) describe artificial intelligence as "a machine's ability to mimic human cognitive functions, such as perception, attention, memory, learning, and decision-making" (p. 3). The term AI is used to describe machines that exhibit cognitive capabilities, allowing them to communicate intelligently with each other by passing signals (Sanjeev et al., 2020). Machine learning is a process by which machines generate signals.

Conceptual clarifications

Artificial Intelligence (AI)

According to Russell and Norvig (2020), artificial intelligence is defined as "the study of agents that receive percepts from the environment and perform actions" (p. 12).

Artificial intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence, such as learning, problem-solving, and decision-making (Kaplan & Haenlein, 2019). Artificial Intelligence refers to the simulation of human cognitive functions by machines. It includes a wide range of technologies that enable machines to perform tasks traditionally requiring human intelligence, such as

reasoning, problem-solving, decision-making, and learning from experience. (www.sproutsocial.com/insights 2024). Kaplan (2019) defines artificial intelligence as "a collection of technologies that enable machines to perform tasks that would typically require human intelligence, such as learning, problem-solving, and decision-making" (p. 25). Domingos (2018) defines artificial intelligence as "the field of study that seeks to understand and replicate the human ability to learn, reason, and solve problems" (p. 10). Artificial intelligence is a field of computer systems that are designed to perform tasks that typically require human intelligence, such as speech recognition, problem solving, and learning (Gonesh et al., 2023). According to Arakpogun et al. (2021), AI is a collection of Information and Communication Technologies that imitate human intelligence. Grover, Kar, and Dwivedi (2022) defined AI as the ability of a system to acquire knowledge by evaluating data obtained from its external environment, which is then utilized to adapt to existing plans or generate new ones to effectively respond to changes in the environment (Ebuka et al., 2023). Artificial intelligence is often referred to as machine intelligence, displayed by machines, as opposed to the intelligence displayed by human beings. The term AI is used to describe machines that exhibit cognitive capabilities, allowing them to communicate intelligently with each other by passing signals (Sanjeev et al., 2020). Machine learning is a process by which machines generate signals.

AI Gadgets and Tools Used in Business includes

- * Virtual Assistants: such as Amazon's Alexa, Apple's Siri, and Google Assistant are examples of AI-powered virtual assistants used in businesses for tasks such as scheduling meetings and setting reminders (Kaplan & Haenlein, 2019).
- * Chatbots: Many businesses use AI-powered chatbots to provide customer support and answer frequently asked questions (Huang & Yasuoka, 2017).
- * Smart Speakers: Smart speakers like Amazon Echo and Google Home are used in businesses for tasks such as playing music, setting alarms, and controlling smart devices (Manyika et al., 2017).
- 4. AI-Powered Security Cameras: AI-powered security cameras like Nest Cam and Ring Stick Up Cam are used in businesses for security and surveillance purposes (Lee & Lee, 2018). Etc.

Applications of AI in Business are:

- *Customer Service: AI is used in customer service to provide personalized support and answer frequently asked questions (Huang & Yasuoka, 2017).
- * Marketing: AI is used in marketing to analyze customer data, personalize ads, and predict customer behavior (Kaplan & Haenlein, 2019).
- * Supply Chain Management: AI is used in supply chain management to predict demand, optimize inventory, and streamline logistics (Manyika et al., 2017).
- 4. Human Resources: AI is used in human resources to analyze employee data, predict turnover, and personalize training and development programs (Lee & Lee, 2018) etc.

Innovation

Innovation is the process of putting new ideas into work to make new products, services, or processes. It can also involve improving existing products, services, or processes. the context of business, "innovation" refers to the process of introducing new ideas, products, services, or processes that significantly improve a company's operations, solve customer problems, and

drive growth by creating value through creative solutions, often involving the transformation of creative concepts into tangible outcomes that can differentiate a business from its competitors; it encompasses not just technological advancements but also new approaches to business models, organizational practices, and problem-solving strategies, requiring a mindset that embraces change and experimentation to stay ahead in the market. Innovation allows business to differentiate themselves from their competitors. By introducing unique products or services, companies can attract more customers and build brand loyalty (Tdd & bessant 2018.) innovation drives long-term growth by opening new markets and creating new revenue streams. Business that invest in innovation are more likely to sustain their growth and remain relevant (Chesbreugh, 2010).

Small and Medium Scale Businesses.

Small and medium-scale businesses play a vital role in the global economy, accounting for a significant proportion of employment, innovation, and economic growth.

Small and medium scale business are defined as enterprises that have limited resources and personnel, typically with fewer than 500 employees (International Finance Corporation, 2020).A small scale enterprise is a business ventures which has an investment capital of up to one hundred and fifty thousand (N150,000) and employees not more than 50 persons or workers.(Miller 2011) defined small and medium scale enterprise as those enterprises with total assets in capital, equipment, plant and working capital that do not exceed N250000 and employs not more than 30 full-time workers. On the other hand, medium- scale enterprises are companies with operating assets less than (2000, 000) million, and employ less than 300 persons (muogbo, 2013). Many of these enterprises abound in Nigeria due to such factors as natural resources, large markets and abundant skilled labour force (miller, 2011) working capital that do not exceed N250, 000 and employs not more than 30 full-time workers. Service entities with capital not exceeding N150,000 in manufacturing and equipment. Additionally, the Central Bank of Nigeria's 2005 Small and Medium Enterprise Investment Scheme (SMEIS) guidelines described SMEs as ventures with a maximum asset base of 200 million naira, excluding land and working capital, without specifying employee limits (Etuk, Etuk, & Baghebo, 2014). The National Council of Industries (2009) characterizes SMEs as businesses with total costs not exceeding 200 million naira, excluding land. These varying definitions emphasize that small and medium scale business are characterized by their limited asset base and workforce size. Notwithstanding their small scale, small and medium scale businesses play a significant role in economic development, as their aggregate impact often surpasses that of large-scale enterprise.

Artificial Intelligence applications (Apps) for Small and Medium Scale Business AI applications that can be incorporated into the growth and development of small and medium scale business in Nigeria are:

*.Virtual Assistants and Catboats: This AI will revolutionize customer support for small and medium scale business. This AI can handle customers' inquiries, resolve issues, and provide 24/7 support, which will lead to an increase in customer satisfaction and retention. Schönberger (2023) affirmed that with the application of chatbots and virtual assistants, small and medium scale business will recognize the value of powering customer interactions and the important to improve user experience and engagement through AI-powered conversational interfaces.

*Voice Recognition Software: This tool like dragon, naturally speaking help business owners transcribe notes and documents through voice commands, saving time and increase productivity.

*Recommendation Systems: This AI will help small and medium scale business to deliver personalized customer experiences at scale. By leveraging AI algorithms, businesses can analyze customer behavior, preferences, and feedback, allowing tailored product recommendations and targeted marketing campaigns that leads to improved customer relationships.

* Machine Learning: The use of this AI tool will enable small and medium scale business to ensure better quality control and production monitoring. This will enable small and medium scale to predict future trends, customer demands, and market fluctuations.

*Predictive Analytics: Use of this AI tool will enable small and medium scale business to streamline inventory management and reduce costs. It will also help small and medium scale business ensure product availability where and when customers need it. Predictive analytics enables small and medium scale business to perform a comprehensive analysis of vast quantities of data, thereby facilitating the identification of patterns, valuable insights, and potential avenues for business expansion (Ebuka et al., 2023).

*Robotic Process Automation (RPA): RPA is an AI application that helps automate business processes using a well-defined rule engine. It helps automate routine and repetitive task.

Natural Language Processing: This AI tool will help small and medium scale business to automate various tasks such as customer service, content creation, and saving time and resources. It will also help personalize marketing messages and improve customer engagement by providing relevant and timely information to customer.

Financial Management Tools: The incorporation of AI in financial management has the potential to increase the efficiency of small businesses in managing their financial affairs. Financial management tools powered by artificial intelligence offer significant benefits for various financial tasks, including tracking expenses, managing invoices, and predicting financial outcomes. Small and medium-sized enterprises (SMEs) can enhance their financial management processes and boost efficiency in handling monetary matters by implementing these technologies (Ebuka et al., 2023).

Business

Business refers to any organization or entity that engages in commercial, industrial, or professional activities with the goal of generating revenue and creating value for its stakeholders (Nickels et al., 2020). Businesses is the activity that involves individual or groups of persons in production, buying and selling of goods or services with the sole aim of making profit. According to the American Marketing Association (AMA), "business" is defined as "an organization that seeks to earn profits by providing goods and services that satisfy customer needs" (AMA, 2020, para. 1). Similarly, the International Organization for Standardization (ISO) defines business as "an organization or part of an organization that has its own functions and administration" (ISO, 2015, p. 3). In the context of entrepreneurship, business is defined as "the creation and management of a new organization with the goal of earning profits" (Kuratko & Hodgetts, 2020, p. 5).

Benefits of Applying AI in Small and Medium Scale Business

Small and medium-scale businesses play a vital role in the global economy, accounting for a significant proportion of employment, innovation, and economic growth. However, SMBs often face challenges in terms of limited resources, expertise, and infrastructure, which can hinder their ability to innovate and compete with larger enterprises. Artificial intelligence offers a range of opportunities for SMBs to overcome these challenges and drive innovation. The integration of AI in small and medium scale business can bring numerous benefits, including improved efficiency, enhanced decision-making, and increased competitiveness (Manyika et al., 2017). AI can be applied in various areas of small and medium scale business operations, such as customer service, marketing, and supply chain management. AI tools when applied have the potential to benefit small and medium scale business in Nigeria, this includes the following:

- * **Enhanced Decision-Making:** AI-driven analytics can help small and medium scale business make informed decisions by analyzing large datasets and providing insights that might not be apparent through traditional analysis.

- * **Increased Efficiency:** Automation of repetitive tasks such as data entry, customer inquiries, and inventory management allows employees to focus on more strategic activities, improving overall productivity.

- * **Cost Savings:** By automating processes and optimizing operations, AI can help small and medium scale business reduce labor costs and operational expenditures over time.

- * **Personalization:** AI tools can analyze customer behavior and preferences, enabling businesses to create personalized marketing campaigns and improve customer experiences.

- * **Improved Customer Support:** AI-powered chat bots and virtual assistants can provide 24/7 customer support, answering frequently asked questions and resolving issues quickly, which enhances customer satisfaction.

- * **Predictive Analytics:** AI can forecast trends, customer demands, and market changes by analyzing historical data. This helps businesses in inventory management and marketing strategies.

- * **Better Marketing Strategies:** AI can analyze data from various marketing channels to determine the most effective strategies, allowing small and medium scale business to allocate resources more efficiently.
- 8) **Talent Management:** Recruitment and human resources processes can be streamlined through AI tools that assist in resume screening, candidate assessments, and employee engagement analysis.
- 9) **Risk Management:** AI can help businesses identify risks by analyzing patterns in data, which aids in making proactive decisions to mitigate challenges before they escalate.

- * **Scalability:** Implementing AI solutions can prepare small and medium scale business for growth by streamlining operations and making it easier to scale processes without proportional increases in cost or complexity.

- * **Enhanced Security:** AI-driven cyber security tools can help small and medium scale business protect sensitive information by identifying threats and responding to security incidents more swiftly.

- * **Competitive Advantage:** By adopting AI technologies, small and medium scale business can keep pace with larger competitors, ensuring they remain relevant in a rapidly changing technological landscape.

*Data-Driven Insights: With AI, businesses can gather and analyze customer feedback and market trends, helping them refine products and services based on actual data.

AI can also help overcome language barriers and facilitate market expansion through language translation and localization, as well as enhance e-commerce personalization to increase conversion rates and customer satisfaction. These potential benefits demonstrate how AI play a role in Nigeria's economic growth and development. Tasks, such as maintenance will be efficiently handled. This involves the consumption of structured data and rules or data-based decision trees (Aguirre & Rodriguez, 2017). Natural Language Processing: This AI tool will enable small and medium scale business to automate various tasks such as customer service, content creation, and saving time and resources. It will also help personalize marketing messages and improve customer engagement by providing relevant and timely information to customers. Benefits of using AI tools also includes financial management, this has the potential to increase the efficiency of small businesses in managing their financial affairs. Financial management tools powered by artificial intelligence offer significant benefits for various financial tasks, including tracking expenses, managing invoices, and predicting financial outcomes. Small and medium business enterprise can enhance their financial management processes and boost efficiency in handling monetary matters by implementing these technologies (Ebuka et al., 2023). (Ebuka).

Challenges of Implementation of AI in Small and Medium Scale in Nigeria

Small and medium scale business frequently encounter various challenges when implementing cutting edge technological advancements, including artificial intelligence. According to Schönberger (2023), the application of AI in organizations presents a number of challenges that can affect the successful integration of these innovative technologies into existing business operations. The following are some of the challenges that small and medium scale business in Nigeria may face when applying artificial intelligence into their operations.

* Lack of expertise and experience: The primary challenge faced by small and medium-sized enterprises in Nigeria when incorporating AI into their operations is a lack of technical knowledge. Szedlak et al. (2020) argued that a dearth of expertise is the primary challenge to AI application in Small and medium scale business.

* High cost of implementation and maintenance: The expenses associated with implementing and maintaining AI in Small and medium scale business is significantly high, which means that not all businesses can afford to incorporate AI into their operations. Ebuka et al. (2023) stated that small and medium scale business and their owners in Nigeria often believe that the cost of deploying or applying AI and its various technologies is prohibitive in terms of cost. As a result, they tend to shy away from them.

* Data Security and Privacy: The implementation of AI in Nigerian small and medium scale business raises concerns about data security and privacy. The absence of an effective security infrastructure affects the proper integration of AI in Nigerian small and medium scale business.

* Impact on Job Security: Some small and medium scale business in Nigeria resist the application of AI for emotional reasons, such as the fear of job losses. They believe that the incorporation of technology in businesses leads to the displacement (Ebuka et al., 2023).

* The implementation of AI in small and medium scale business affect workers and make them to loss their primary source of income (Ebuka et al., 2023).

Also the Challenges in Integrating AI with Existing Systems: The implementation of AI tools in existing businesses poses certain challenges. According to Ebuka et al. (2023), the "this is how we used to do it" mentality has deterred businesses, particularly those with limited human or material resources in Nigeria, from applying technology and AI in their operations. They are hesitant to change and stick to traditional methods, sometimes due to fear of the unknown consequences of embracing AI. Therefore, it is important for Small and medium scale business to establish a seamless interface between AI technologies and their existing business structures to ensure most desirable use of AI for their growth and development.

The future of AI in Small and Medium-Scale Businesses.

Small and medium scale business is expected to be transformative, fostering innovation, enhancing operational efficiency, and improving customer experiences. Future Impacts of AI on small and medium scale business includes:

- *Access to Advanced Technologies: The democratization of AI technology means that small and medium scale business can access tools that were previously only available to larger corporations. Cloud-based AI services provide affordable solutions for small and medium scale business.

- *Improved Marketing Strategies: AI tools can analyze consumer data to optimize marketing campaigns. This allows small and medium scale business to target their advertising efforts more effectively and achieve higher conversion rates.

- *Scalability: With AI, small and medium scale business can easily scale their operations. AI can handle increased customer inquiries, manage more extensive inventories, and improve services without a correspondingly high increase in costs.

- *Automation of Routine Tasks: AI technologies can automate repetitive tasks, allowing employees to focus on more strategic activities. This can lead to increased productivity and reduced operational costs.

- *Enhanced Customer Experience: AI can personalize customer interactions by analyzing data from previous interactions and purchasing behaviors. This helps SMEs tailor their offerings to meet the specific needs of their customers, thereby increasing customer satisfaction and loyalty.

- *Data-Driven Decision Making: small and medium scale business can utilize AI to analyze large volumes of data to gain insights into market trends and customer behavior. This data-driven approach can inform better business strategies and help companies remain competitive.

- *Cost Reduction: AI tools can help small medium scale business optimize their supply chain and inventory management, leading to significant cost savings. Predictive analytics can forecast demand more accurately, reducing excess inventory and storage costs.

CONCLUSION

Artificial Intelligence (AI) technologies reshape how businesses operate and innovate. As AI advances, small and medium scale business must embrace their potential and support their power to remain competitive in the ever-evolving business environment. By incorporating AI-driven solutions, small and medium scale business can unlock new opportunities for growth, efficiency, and success, positioning their ventures at the forefront of the business future. Therefore, incorporating AI tools into the operations of Small and medium scale business in Nigeria will enhance their growth and development. The application of artificial intelligence in small and medium-scale businesses has the potential to drive innovation,

improve efficiency, and enhance customer experiences. As AI technologies continue to evolve and improve, SMBs that adopt AI are likely to gain a competitive advantage in the market. This paper explore the applications, benefits, and challenges of AI adoption in SMBs, providing insights and recommendations for business leaders and policymakers.

RECOMMENDATIONS

The following recommendations were made:

1. The Government should develop a national strategy for AI that encourages, integrates, and maintains its use among small and medium scale in Nigeria.
2. It is suggested that the government and Small and medium scale business management should work together to create secure data mechanisms and provide staff training and skill development to enhance AI capabilities.
3. The management of small and medium scale business should work towards in creating a smooth integration of artificial intelligence (AI) technologies into their current business operations to achieve optimal growth and development
4. The government and small and medium scale business management should clearly define the specific business challenges that AI can address and identify potential areas for improvement or innovation.
5. The government and small and medium scale business management should build a robust IT infrastructure capable of supporting AI development, including computational power, storage, and necessary tools.
6. The government and the small and medium scale business management should ensure that Pilot projects and experimentation starts with smaller, manageable AI projects to test feasibility, refine algorithms, and learn from initial results.

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